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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/987,046	11/13/2001	Bogdan Kosanovic	TI-33126 (1.120US)	6300

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EXAMINER
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SINGH, RAMNANDAN P

ART UNIT	PAPER NUMBER
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2644

DATE MAILED: 04/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/987,046

**Applicant(s)**

KOSANOVIC ET AL.

**Examiner**

Ramnandan Singh

**Art Unit**

2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,8-11,13-15,17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,8-11 and 13-15 is/are allowed.
- 6) ☒ Claim(s) 17-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments, filed on Sept. 10, 2004, have been fully considered and are not persuasive.

(i) Applicant's argument---"Further, in order to derive Examiner's eq. (1), the examiner inserted a factor  $\mu_{\text{fixed}}$  without suggestion nor support for such a factor in the Zerguine reference" on page 9.

<sup>response</sup>  
Examiner's response—The Examiner disagrees. The Applicant is respectfully directed to Para. 8 on page 5 of this Office Action, wherein the inequality in Eq. (18) of Zerguine is converted to an equality by introducing a constant ( $\mu_{\text{fixed}} < 1$ ) as shown there. The introduction of a constant is necessitated to convert an inequality to an equality which is well-known in the art.

(ii) Applicant's argument---"Sievers "relates to video image compression" and is non-analogous art" on page 9.

Examiner's response—The Examiner disagrees. This specific reference of Sievers relates to an application of "base two" mathematical operations which is generic in nature and is not restricted to a specific art.

## 2. Status of Claims

Claims 1, 13 and 15 are amended.

Claims 2-7, 12 and 16 are cancelled.

Claims 1, 8-11, 13-15 and 17-18 are pending.

***Drawings***

3. Since the invention claimed in **amended claim 1** is illustrated in Fig. 1, the "prior art" label for Fig. 1 is no longer required.

***Claim Rejections - 35 USC § 103***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zerguine et al [IEE Proc. –Vision and Image Signal Processing, Vol. 146, No. 4, August 1999] in view of Sievers et al [US 5,742,346] and further in view of Sih [US 5,687,229].

**Regarding claim 17**, Zerguine et al teach a method of converging an adaptive filter of a communication channel, comprising the steps of:

using a step size,  $\mu_2$ , bounded between two limits, as shown in Equation (18) of Zerguine et al.

In order to establish a correspondence between the description of the reference and the description of the claimed matter of Applicant, the following simplification is in order:

Equation (18) of Zerguine et al can further be rewritten as:

$$\mu_2 = \frac{2 \mu_{\text{fixed}}}{6 N_2 \sigma_x^2 E[w^2(n)]}$$

where  $\mu_{\text{fixed}}$  is a constant (i.e. nominal value of the step-size) with  $\mu_{\text{fixed}} < 1$ , to ensure that

$$\mu_2 < \frac{2}{6 N_2 \sigma_x^2 E[w^2(n)]};$$

$N_2$  is the filter length in taps;

$\sigma_x^2$  is the far-end power; and

$E[w^2(n)]$  is the noise power.

Expressing the above equation in a general form of the step-size function, we have the following equation:

$$\mu_2 = \frac{2 \mu_{\text{fixed}}}{f_1(N_2) f_2(6p_x) f_3(E[w^2(n)])} \quad (1)$$

Equation (1) shows that it contains multiplication and division which involve complex computational operations for determining a value of the step-size,  $\mu_2$  for a given sample. It may, however, be noted that logarithms allow multiplication and division to be replaced by simpler operations of addition and subtraction, respectively. In addition, no details regarding initializing the above adaptive filter having a step-size and a penalty point value (i.e. **noise power**) are given which are essential for an operational echo canceller. So one of the ordinary skill in the art would have been motivated to seek any known method of initializing the above filter, such as Sih [US 5,687,229].

Zerguine et al do not teach expressly a method to initialize the filter as well as applying logarithms to simplify the computations operations.

Sievers et al disclose demonstrating the application of the logarithm (for example, base two) to facilitate performing mathematical operations on the energy values [col. 5, lines 14-28].

Sih teaches initializing both state filter 158 and echo canceller filter 160 [Fig. 5] using a state machine 180 at the start of operation by providing in the control input to the filter coefficient generator a step-size and penalty point values (i.e. **variable threshold parameters for noise power**). Sih further teaches changing the step-size value by adjusting the nominal step-size value [Fig. 8; col. 15, lines 38-59].

Zerguine et al, Sievers et al and Sih are analogous art because they are from a similar problem solving area, viz. , adaptive filtering.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art (i) to apply the base two logarithm as suggested by Sievers to facilitate performing mathematical operations on the step-size of Zerguine et al ( as given in Equation (1) above), and thereby reducing computational complexity [Sievers et al; col. 5, lines 25-228]; and (ii) to perform the filter initialization using a step-size and noise threshold of Sih with Zerguine et al permitting a fast initial filter convergence [Zerguine et al; col. 15, line 48 to col. 16, line 7].

Thus, applying a base two logarithm to Equation (1) and assigning the result to a variable,  $m$ , ( to represent it into an equivalent form), the following equation is obtained:

$$m = \log_2 (\mu_2) = 1 + m_0 - L - P_x - N \quad (2)$$

where  $m_0 = \log_2 (\mu_{\text{fixed}})$  ,  $L = \log_2 (f_1(N_2))$ ,  $P_x = \log_2 (f_2(6p_x))$ , and  
 $N = \log_2(f_3(E[w^2(n)]))$ ,

wherein the noise power,  $N$ , corresponds to a penalty point value to control the step-size of the filter. It may, however, be noted that Applicant selects a penalty point value subjectively based on experience, and applies this to control the effect of noise

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on the filter convergence [See Applicant's specification, page 8, lines 4-8], wherein Zerguine et al teach computing the **penalty point value** objectively and continuously.

In light of Equation (2) above, Zerguine et al teach combining a nominal step-size value (i.e.  $m_0$ ) and a penalty point value (i.e.  $N$ ) to generate a step-size value ; and dynamically (i.e. **at sample  $n$** ) changing the step-size by adjusting the nominal step size value.

**Regarding claim 18**, the combination of Zerguine et al, Sievers et al and Sih teaches selectively changing the step size value,  $m$ , by adjusting either the nominal step-size value,  $m_0$ ; the penalty point value,  $N$ , or both the nominal step-size value,  $m_0$ , and the penalty point value,  $N$  [See Equation (2) above].

### ***Allowable Subject Matter***

6. Claim 1 is allowable over prior art of records.
7. Claims 8-11, 13-15 are allowable due to dependence from claim 1.

### ***Conclusion***

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).



A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ramnandan Singh whose telephone number is (571) 272-7529. The examiner can normally be reached on M-TH (8:00-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tran Sinh can be reached on (571) 272-7564. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ramnandan Singh  
Examiner  
Art Unit 2644



**SINH TRAN**  
**SUPERVISORY PATENT EXAMINER**